

REMARKS

Disposition of Claims

Claims 29-46 and 49-58 are currently pending. New Claim 59 is now added.

Claim Amendments

New Claim 59 is added. New Claim 59 is based on Claim 29 and further recites the concentration of the phosphoric acid in the resulting membrane as disclosed on page 39, lines 4-12 of the English translation of the instant application.

Rejection of Claims Under 35 U.S.C. § 102

Claims 29-34, 36, 41-43, 48-50, and 52-58 are rejected under 35 U.S.C. § 102(b) as being anticipated by US Patent Publication 2004/0062969 ("Sakaguchi").

The Examiner maintained the rejection based on inherency. The Examiner previously asserted that Sakaguchi teaches the steps A) through E) of base Claims 29, 54 and 57, but does not expressly teach step F), partial hydrolysis of the polyphosphoric acid. The Examiner stated that the polyphosphoric acid moieties of the membranes of Sakaguchi are expected to inherently partially hydrolyze, thus resulting in the same product as the one claimed by the instant claims. The Examiner referred to paragraphs [0210] and [0254]-[0260] of Sakaguchi, and further relied on "Polyphosphoric Acid Assay" ("Innophos"), for their teaching that the polyphosphoric acid is hygroscopic and, therefore, is subject to partial hydrolysis under atmospheric conditions.

Applicants previously argued that the Examiner's argument that Sakaguchi inherently teaches all the steps of Claims 29, 54 and 57 is based on an incorrect interpretation of the teaching of Sakaguchi, including paragraphs [0210] and [0254]-[0260]. Specifically, Applicants noted that these paragraphs teach *complete removal*, not partial hydrolysis, of the polyphosphoric acid moieties. For example, paragraph [0255] expressly states:

After completing the polymerization, the mixture was allowed to cool, poured into water, and the polymer obtained was repeatedly rinsed in a blender until pH test paper was neutralized. (*Emphasis added.*)

Because the pH is *neutral*, based on this description alone it is clear that polyphosphoric acid *was completely removed*, with no or little phosphoric acid left in the polymer. Whether this removal of polyphosphoric acid involved hydrolysis is irrelevant: even if the hydrolysis occurred, the resulting product is by necessity very different from the product of a process recited by pending Claims 29, 54 and 57 because the acid (hydrolyzed or unhydrolyzed) has been removed.

The Examiner now takes the position that:

[a]lthough Sakaguchi *et al.* teach of rinsing the polymerized material until the pH is neutral, this is not an indication that no polyphosphoric acid remains in the polymer. (Office Action of September 23, 2008, page 10, last paragraph.)

The Examiner further asserts that:

- “some of the polyphosphoric acid would remain in the polymerized product” (Office Action, page 10, last paragraph);
- “Applicants has not shown that *all* of the polyphosphoric acid within the solution is removed” (Office Action, page 11, second to last paragraph); and
- “[t]he rinsing only rids Sakaguchi *et al.*’s membrane of excess polyphosphoric acid” (Office Action, page 12, first paragraph).

Applicants respectfully disagree and submit that the Examiner’s assertions are scientifically incorrect and legally improper. Furthermore, Applicants submit that new Claim 59 is patentable over Sakaguchi for additional reasons.

First, Applicants submit that after “repeatedly rinsed in a blender until pH test paper was neutralized”, the polymer of Sakaguchi is likely to contain *no* (detectable) polyphosphoric acid. To support this assertion, Applicants submit herewith Exhibit A, the Material Safety Data Sheet for polyphosphoric acid (manufactured by SM Chemicals, India). Exhibit A, section 9 (page 2), states that polyphosphoric acid is *completely* soluble in water, with the formation of orthophosphoric acid. In other words, “repeated rinsing”, *i.e.* repeated removal of used water and addition of fresh water to the polymer comprising polyphosphoric acid will *completely* remove polyphosphoric acid (within the limit of detection). Furthermore, Applicants submit herewith as Exhibit B the Safety Data Sheet for orthophosphoric acid (manufactured by OM Group Ultra Pure Chemicals Ltd, UK). As stated in section 9 of Exhibit B (page 3),

orthophosphoric acid is miscible in water in *all proportions*. In other words, as soon as it is formed by the hydrolysis of polyphosphoric acid, orthophosphoric acid would be immediately removed by water (within the limit of detection).

Accordingly, the process employed by Sakaguchi will result in *complete* removal of polyphosphoric acid and the products of its hydrolysis. While it is possible that *individual molecules* of either the polyphosphoric acid or the orthophosphoric acids may remain within the polymer of Sakaguchi, the concentration of such products is expected to be below the limit of detection. Therefore, the Examiner's assertions that "not [...] *all* of the polyphosphoric acid within the solution is removed" and that "some of the polyphosphoric acid would remain in the polymerized product" are scientifically unfalsifiable. An unfalsifiable statement cannot form a basis of a claim rejection based on prior technical references.

Secondly, Applicants submit that the Examiner's position is legally untenable. The proper inquiry into patentability of a product-by-process claims, such as pending independent claims, is whether the *material* differences between the Applicants' products and those of Sakaguchi exist. The Examiner, instead, appears to concentrate on theoretical presence in the membranes of Sakaguchi of undetectably low amount of an ingredient, which, even if present, would not bridge the gap in physical properties between the membranes of Sakaguchi and those of Applicants.

Applicants direct the Examiner's attention to M.P.E.P. §2113, which states regarding product-by-process claims:

The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art [...]
(*Emphasis added.*)

Applicants also direct the Examiner's attention to the decision of *In re Garnero*, 412 F.2d 276, 162 USPQ 221 (CCPA 1969), which is quoted in M.P.E.P. §2113. In *In re Garnero*, The court gave clear guidelines for examination of a product-by-process claim:

The correct inquiry [...] is whether the product defined by claim 1 is patentably distinguishable over the [*cited references*] in view of the structural limitation [...] (412 F.2d 276 at 279) (*Emphasis added.*)

In the instant case, evidence presented by Applicants (paragraphs [0254]-[0260] of Sakaguchi in view of Exhibits A and B) demonstrates that even if the polyphosphoric acid or the orthophosphoric acids could remain within the polymer of Sakaguchi, the concentration of such products is expected to be below the limit of detection. In contrast, Applicants teach *partial* hydrolysis of polyphosphoric acid. Applicants teach that the partial hydrolysis of polyphosphoric acid leads to strengthening the membrane and to decrease in the layer thickness (page 37, lines 21-25 of the English translation of the instant specification). Applicants teach that the degree of hydrolysis of polyphosphoric acid permits control over the conductivity of the membrane (page 39, lines 4-12). In other words, the presence of phosphoric acid within the membrane is one of the elements of Applicants' invention. This contrasts with the complete (within the limit of detection) removal of polyphosphoric acid and its hydrolysis products by Sakaguchi. Therefore, the "structural limitations" "implied by the process steps" of Applicants' base claims result, with necessity, in a product different from that disclosed in Sakaguchi.

Moreover, Applicants note that the teachings of Sakaguchi direct one of ordinary skill in the art *away* from raising the concentration of phosphoric acid above the limit of detection. Indeed, one of the stated objectives of Sakaguchi's invention is to provide "ion conductivity by introducing sulfonic acid groups or phosphoric acid groups into a polybenzazole compound" (Sakaguchi, paragraph [0021]). Sakaguchi further states that the "ion conductivity" of his membranes are due to the presence of phosphonic acid groups and sulfonic acid groups (Sakaguchi, paragraph [0122]). Thus, when Sakaguchi performs ion conductivity measurements, such as in Example 1 (Sakaguchi, paragraph [0259]), the presence of *additional* ion conductor, such as phosphoric acid, would be *undesirable*, as it would distort the measurements by inflating the value of conductivity. Accordingly, one of ordinary skill in the art would not, based on the teachings of Sakaguchi, raise the concentration of phosphoric acid above the limit of detection.

Finally, Applicants submit that new Claim 59 is patentable over Sakaguchi for yet another reason. Sakaguchi does not teach that the concentration of phosphoric acid in the membrane is from 10 to 80 mols of phosphoric acid per mol of a repeating unit of the polyazole polymer, as recited in new Claim 59. The presence of phosphoric acid in the recited range, however, confers unexpected advantages onto the Applicants' membranes, as stated above: improved mechanical strength and control over the conductivity of the membranes.

It is thus established that the process of Sakaguchi (polyphosphoric acid is removed) is different from the process of the instant base claims (polyphosphoric acid is retained, partially hydrolyzed). The difference between the products obtained by these different processes follows with necessity: the membranes of Sakaguchi do *not* contain polyphosphoric acid, while the membranes of Claims 29, 54 and 57 *do* contain such moieties.

Reconsideration and withdrawal of the rejection are requested.

Rejection of Claims Under 35 U.S.C. § 103

Dependent Claims 35, 37-40, 44, 45, 46, 51 are rejected over a combination of Sakaguchi in view of Matsuoka, Gerber, Nakao, Akita or Kerres, previously of record. Applicants respectfully disagree.

Sakaguchi is discussed in detail above. Sakaguchi does not teaches or suggest the membranes with polyphosphoric acid moieties.

The secondary references each teach polymers made up of monomer units that may be used in the present invention, but do not teach or suggest membranes with partially hydrolyzed polyphosphoric acid moieties. Therefore, none of the deficiencies of Sakaguchi are overcome by the combination of references.

Reconsideration and withdrawal of these rejections is respectfully requested.

CONCLUSIONS

The pending claims have been amended as necessary to more particularly point out and distinctly claim the invention. No new matter has been added. In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue.

If the Examiner feels that a telephone conference would expedite prosecution of this application, she is invited to call the undersigned.

Respectfully submitted,

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